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Sanitary and Bacteriological Survey Five Islands — Parrsboro Shellfish Area #20 Nova Scotia

A SANITARY AND BACTERIOLOGICAL SURVEY

FIVE ISLANDS - PARRSBORO

SHELLFISH AREA # 20

NOVA SCOTIA

by

M. D. Baxter and G. R. Julien

Marine Surveillance Section
Environmental Services Branch
Environmental Protection Service
Halifax, Nova Scotia

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ABSTRACT

Through the period June 7 to July 30, 1976, a bacteriological and physical sanitary investigation was carried out in shellfish area N.S. 20, extending from Parrsboro Harbour to Gerrish Mountain, on the north shore of the Bay of Fundy, Nova Scotia.

Median coliform levels within the survey area demonstrate the need for the maintenance of the existing closure (N.S. 20-4) on Parrsboro Harbour and to recommend implementation of two additional closures within the study area, one at Harrington Beach and a second on a tributary to the Five Island sector.

RESUME

Du 7 juin au 30 juillet 1976, on a effectué une étude bactériologique et sanitaire des eaux du secteur coquillier N.S. 20, s'étendant du havre Parrsboro au mont Gerrish, sur la côte nord de la baie de Fundy (Nouvelle-Ecosse).

Le nombre moyen de coliformes nécessite le maintien de l'interdiction N.S. 20-4 dans le havre et en impose deux autres près de la plage Harrington et dans un tributaire du secteur de Five Islands.

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1 INTRODUCTION

A sanitary and bacteriological study in shellfish growing area N.S. 20 was conducted along the north shore of the Bay of Fundy, extending from Partridge Head at Parrsboro Harbour, east to Gerrish Mountain at Five Islands, by the mobile laboratory staff of the Environmental Protection Service, Atlantic Region, through the period of June 7th to July 30th, 1976.

The rationale for conducting a study on this sector of the Bay of Fundy is to update information on the overlaying water quality and the on-shore sanitary conditions affecting the shellfish harbesting area.

The study area for discussion purposed in this report is divided into three sectors (I, II and III). Sector I as shown in Figure 1 includes Parrsboro Harbour and approaches, extending from Partridge Head on the west to Clarke Head on the east. Sector II as shown in Figure 2 extends from Clarke Head on the west to Harrington Beach on the east. Sector III as shown in Figure 3 extends from Harrington Beach on the west to Gerrish Mountain on the east, including Five Islands.

The existing closure on Parrsboro Harbour (N.S. 20-4) is determined by this study to be adequate and to remain in effect. Two additional closures, one at Harrington Beach, and a second on a tributary in the Five Island sector are recommended by this report.

2 MATERIALS AND METHODS

2.1 Sampling

Water samples were collected in sterile glass bottles at a depth of approximately one meter by means of a rod sampling device. All samples collected were held in an insulated cooler and transported to the mobile laboratory for analysis, within one hour of collection.

2.2 Bacteriological Analyses

All water samples were tested for fecal coliform levels by the multiple tube dilution (MPN) method according to the A.P.H.A. "Recommended Procedures for the Bacteriological Examination of Sea Water and Shellfish" (A.P.H.A. 1970). Bacto-Lauryl Tryptose Broth was used as the presumtive test medium with incubation at 35±0.5°C for 24 and 48 hours, and positive cultures were transferred to Bacto-EC Medium and incubated in a water bath at 44.5±0.2°C for 24 hours. The most probable number (MPN) of fecal coliform bacteria was derived using a 5-tube dilution MPN table.

2.3 Physical Data

To facilitate the interpretation of bacteriological data, several physical parameters were also measured. Salinities (ppt) were determined by the Knudsen Method (Anon. 1962) from water samples collected from selected stations (Appendix Table). Water temperatures were also recorded at several stations. The tidal stage was estimated and recorded for the time period encompassing the beginning and end of each sampling run. Daily precipitation was collected and recorded at the Mobile Laboratory on site in the survey area.

3 SANITARY RESULTS

Investigation of the onshore sanitary conditions are routinely carried out as an integral part of the bacteriological surveys. A principal concern is the occurrence of disease-causing organisms that may be accumulated by shellfish, if sewage and waste matter from human or other animals enters the shellfish environment. Contributions of bacteria from these sources frequently occur in response to rainfall induced landwash.

3.1 Sector I

Parrsboro Harbour is on the north shore of Minas Basin, 60 miles west of Truro, Nova Scotia. The harbour was in the past, a very active shipping port, and is now reduced to a service center for a few small fishing craft and recreational activity. The harbour shoreline is surrounded by the Town of Parrsboro (population 1800) and small commercial industry.

Sanitary wastes from the Town are disposed of by various means, such as cesspools, dry wells, septic tanks, and by direct discharge to the water. Thus a large volume of untreated sanitary waste enters harbour water.

There is a small shellfish resource at the outer edge of the harbour, not sufficient to be of commercial significance. The existing shellfish closure, N.S. 20-9, is reasonable and adequate to protect public health and imposes no adverse effect to commercial shellfishing interest.

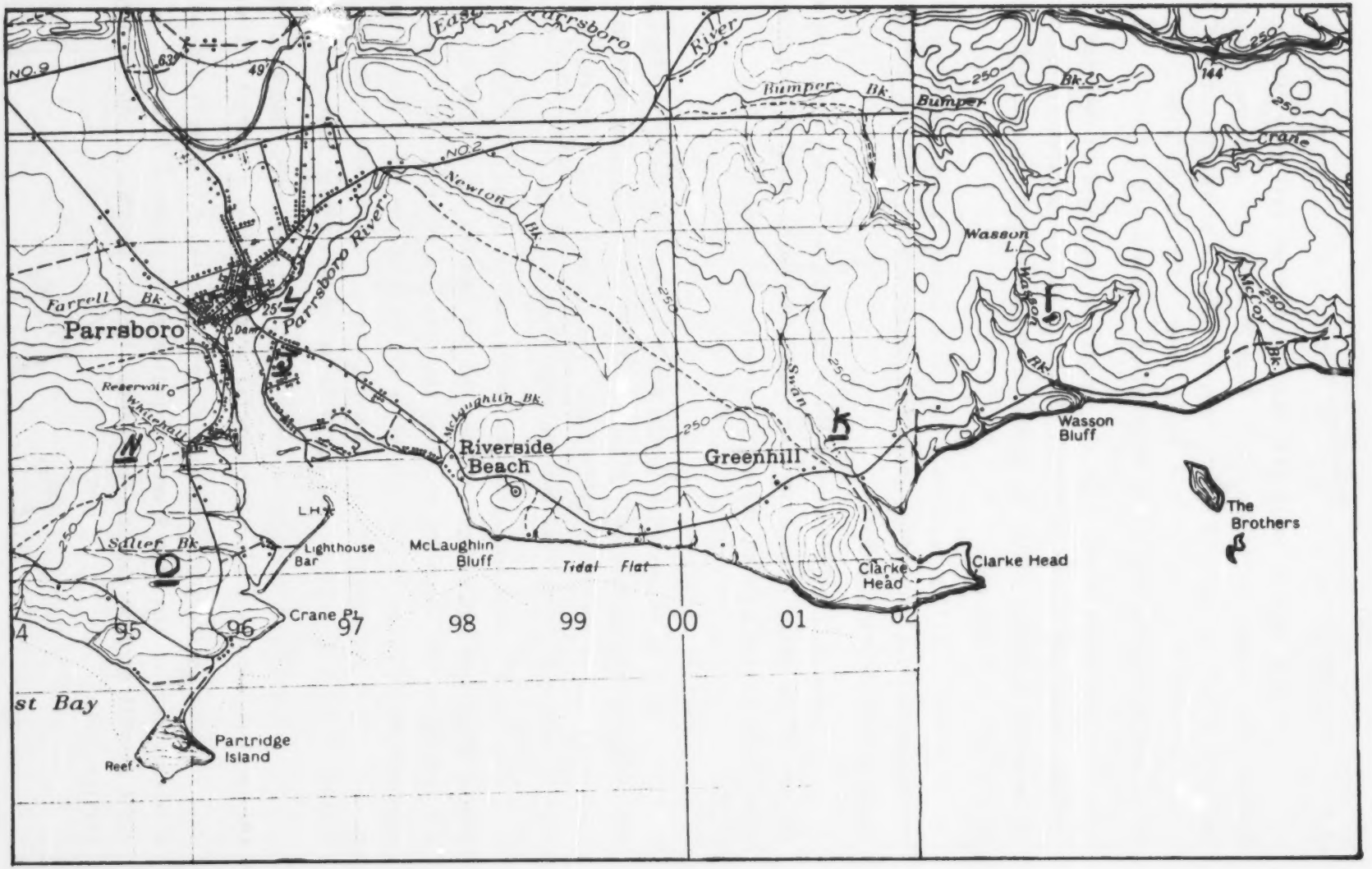

FIGURE 1 TOPOGRAPHIC MAP SECTOR I, PARRSBORO, N.S.

3.2 Sector II

Clarke Head to Harrington Beach, extending east from Parrsboro Harbour, is a wooded shoreline. Less than 20 homes are scattered throughout this sector and each is remote from drainage to shoreline waters. A number of small tributaries, i.e. Moose River, Little Moose River, Swan Brook and Harrington River flow from inland wooded areas.

Harrington River, near the estuary is populated by numerous resident homes and summer cottages. Sanitary waste from several sources reaches the shoreline either by direct drainage or from inadequate treatment systems and soil seepage.

The shellfish resource within this sector is both commercial and recreational. The harvesting areas include the offshore islands and the flats west of Harrington Beach.

A recommended closure on the estuary of Harrington River and a portion of the Beach is necessary for public health protection and imposes very little restriction on the areas harvested for shellfish.

3.3 Sector III

The area between Harrington Beach and Gerrish Mountain, including the offshore islands is a well established shellfish producing area for both commercial and recreational harvesting. The current trend indicates a significant level of recreational harvesting by tourists.

The resident population is located mainly along the highway (Route #2). Numerous summer cottages and two camping and trailer parks are located on the shoreline fronting the offshore islands. No visual evidence was detected of sanitary waste drainage to the shore from either of the tourist park facilities. However, the collection and treatment systems of both operations were noted to be loaded to peak capacity.

The shellfish resource within this sector is very important to the local economy as a direct commercial product and as a tourist attraction.

The sanitary observations suggest the need for a small closure at the estuary of the East River, as indicated by Figure A-2, and to maintain close surveillance on the sanitary waste disposal systems at the camping and trailer parks.

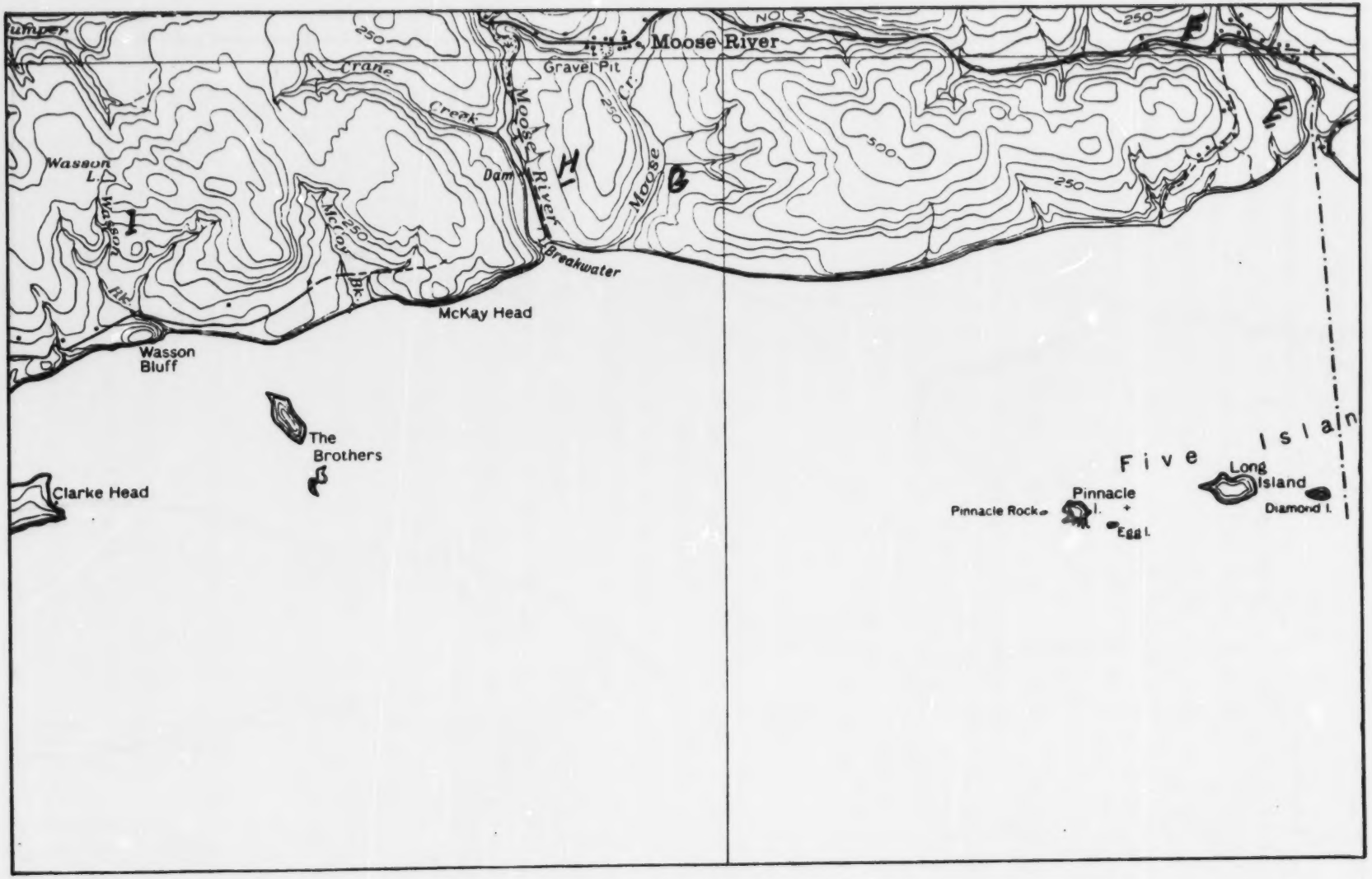

FIGURE 2 TOPOGRAPHIC MAP, SECTOR II, CLARKE HEAD - HARRINGTON BEACH, N.S.

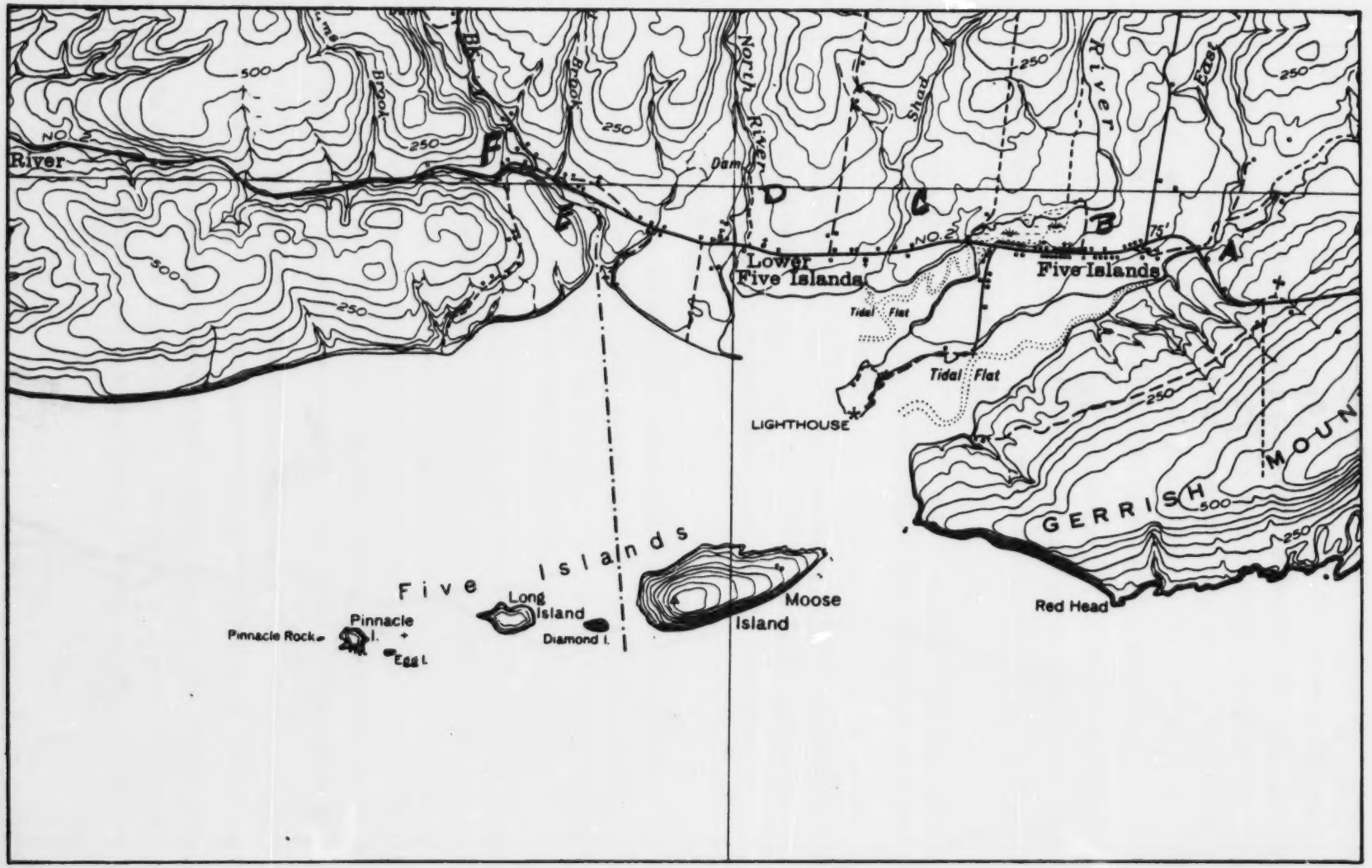

FIGURE 3 TOPOGRAPHIC MAP SECTOR III FIVE ISLANDS, N.S.

4 CURRENTS, TIDES AND RAINFALL

The tidal range for the area is -09 ft. to +47 ft. and a maximum high of 51.9 ft.; the mean tide is 24.2 ft. as reported by Canada Hydrographic Service. The survey period extended for 51 days from June 7 to July 28, 1977. Daily weather data were recorded by the Mobile Laboratory staff using equipment and instruments provided by Atmospheric Environment Service. This data is presented in Table A-7 of this report.

Total rainfall throughout the 51 days was 5.32 in. (13.5 cm.); on only one occasion did the amount exceed more than 1 in. in 24 hours. On July 13 precipitation totalled 2.16 in. (8.0 cm). The induced landwash was reflected by a significant increase in fecal coliform density in all tributary streams and estuariesfor several days following the event.

5 BACTERIOLOGICAL RESULTS

5.1 Sector I

In Parrsboro Harbour, 72 water samples were collected from the 24 selected sampling stations (Figure A-1 and A-4). These data clearly demonstrate the effect of sanitary sewage discharge on the harbour waters. At stations 1, 2 and 3 median fecal coliform levels ranged from 240 to 540. Median densities at stations 4, 5 and 6 ranged from 17 to 33 reflecting a rapid dilution of wastes in the outer harbour.

Samples collected between the harbour mouth and the present closure line were low and within acceptable limits as were samples collected along the outer shoreline. Given that the sampling in this sector was limited and restricted to periods of low runoff, it is felt that the maintenance of the existing closure is necessary. This is due to the need to retain a buffer zone encompassing the area between Crane Pt., and Riverside Beach outside the bar. It is reasonable to expect that in this latter area water quality will deteriorate beyond acceptable limits following periods of heavy runoff.

5.2 Sector II

In the Clarke Head, Harrington Beach sector, 163 water samples were collected from 45 sampling stations (Table A-2 and A-5). The median values at all sampling stations from No. 1 through 35 illustrate excellent water quality with fecal coliform levels well within acceptable limits.

The area near the mouth of Harrington River, sampling stations 36-43, periodically has significant fecal coliform levels particularly following periods of precipitation i.e. July 26. A total of 0.55 in. or 1.39 cm. of precipitation was recorded for the area for July 23-25 proceeded by five days of clear and dry weather. This comparatively small amount of rainfall resulted in an increase in fecal coliform densities in the receiving waters. A similar but less pronounced increase also was observed on July 14, 48 hours following 2.16 inches of rainfall.

5.3 Sector III

A total of 206 water samples were collected from 45 stations within Sector III, from Harrington Beach to Gerrish Mountain (Figure A-3 and A-6), including the offshore islands. Median values throughout the area were generally low, none exceeded a count of 8 and 90 percentiles proved to be less than 2. A significant increase in bacterial density did occur on July 14 throughout the 45 sampling stations following a 2.16 in. rainfall recorded for July 13, and particularly so at stations 24 through 45. This is considered to be related to increased stream flow and landwash.

The fecal coliform densities in the Sand Point - Gerrish Mountain section following the July 13 storm were consistently elevated at all the stations; the median density was 49 and counts ranged from 17 to 130 MPN on this sampling date (July 14). These counts were generally higher than those observed in other portions of Sector III on this date. This fact combined with sanitary observations suggests a public health concern associated with shellfish harvesting in this section.

5.4 Streams and Tributaries

The median values for streams entering Sector I ranged from 4 - >2400. Three streams, in particular Whitehall Brook, Farrell Brook and the East Parrsboro River, showed consistent evidence of fecal contamination with median values ranging from 920 - >2400. Median fecal coliform levels in the streams sampled in Sector II ranged from 8-45 for the survey period. The streams sampled in Sector III, with the exception of Beaver Brook, had median fecal coliform levels ranging from 17 to 43. Beaver Brook had a median fecal coliform level of 79 for the survey period which is noticeably higher than most of the streams sampled.

6 DISCUSSION

The criterion used for the classification of approved shellfish growing waters is a median fecal coliform value of 14 MPN per 100 ml with no more than 10 percent of the samples exceeding an MPN of 43 for a 5-tube decimal dilution test. In addition to bacteriological data, sanitary information on the study area is also included in assessing the closure.

6.1 Sanitary Conditions

The area extending from Gerrish Mountain on the East to Parrsboro Harbour in the west is a well established shellfish resource area, and as such requires close surveillance. Increased tourist population, with expanded accommodation, and the resident population growth are conditions that may adversely affect the quality of the local shellfish resource. The resources from the Five Islands shore flats and the offshore islands is the principal source of revenue for many of the local residents and the effect of any closure and the associated pollution sources is a matter for concern.

The Parrsboro sector supports the greater proportion of the tourist industry in the surrounding area, placing excessive load on the marginal sanitary waste disposal systems. The effect from these many sources on shellfish resources is normally limited to the harbour water and although presently under closure it is a potential public health hazard if shellfish were consumed from this area. From Clarke Head east, the shoreline in sparsely populated to Harrington Beach, thus a small resident population and summer homes are the only known sources that affect the local water quality. The beach area is generally a recreational site and a landing point for small marine craft. A closure on this section is considered to be necessary for the protection of public health. Further east to Gerrish Mountain, resident homes are more numerous, however, the increase in construction of newer homes throughout the area during the past decade is not noticeable, and attention is more directed to the increased tourist accommodation and possible effects on surrounding water quality.

6.2 Bacteriological Conditions

Table 1 presents a summary of fecal coliform data for three shoreline areas which, as discussed previously, are cause for public health concern. From this summary it is apparent that Parrsboro Harbour, Harrington Beach and the Sand Point-Beaver Brook areas do not meet bacteriological water quality criteria

TABLE 1 SUMMARY OF FECAL COLIFORM DATA SHOWING THE % VALUES EXCEEDING 43 MPN IN EACH OF THE RECOMMENDED CLOSURE SECTORS

LOCATION	STATION NUMBERS	TOTAL NO. OF SAMPLES	NO. OF SAMPLES EXCEEDING 43 MPN	% OF SAMPLES OVER 43 MPN
Parrsboro Harbour Figure 1	1-12	36	15	41.6
Harrington Beach Figure 2	35-46	29	8	27.5
Five Islands Figure 3	37-47	52	12	23.0

for areas approved for shellfish harvesting based on the 90th percentile of 43 MPN.

6.3 Stream Sampling Stations

After reviewing the water data on the tributary streams several general conclusions can be reached. First bacteriological water quality at least in terms of fecal coliform bacteria, markedly deteriorates following major rainfall events. Data collected on July 13 following 2.12 inches of precipitation show high fecal coliform levels in all the tributary streams (see Table A-4). These levels appear to be completely independent of observed sanitary conditions. Secondly, fecal coliform levels in these streams during periods of little or no rainfall vary considerably from stream to stream and more adequately reflect observed sanitary conditions (see Figures 1, 2, 3).

During dry periods several of the streams entering the Parrsboro closure show consistent evidence of fecal contamination. These streams include Whitehall Brook, Farrell Brook, the East Parrsboro River and obviously contribute to the present contamination of the harbour. In the Clarke Head sector the streams sampled have consistently low levels of fecal coliform bacteria under dry conditions. Fecal coliform levels in the streams of the Five Islands sector in dry periods are also generally low with one exception. Beaver Brook showed consistent low levels of fecal contamination during dry periods throughout the duration of the study.

The stream samples in this report are representative of very adverse conditions of precipitation and all tributary streams appear to contribute significant quantities of fecal coliform bacteria to the shoreline waters under storm conditions. Under more normal conditions of flow, only a few of these streams (as discussed previously), appear to contribute significantly to the contamination of the adjacent growing areas. From the observed sanitary condition one is forced to tentatively conclude the health significance of the fecal coliform bacteria discharged by many of these streams (given the noted exceptions) is probably limited at worst and, in fact, unknown.

7. CONCLUSIONS

Having reviewed the observed on-shore sanitary conditions, the bacteriological data, weather conditions and other related physical features, the following conclusions have been determined

1. The existing shellfish closure (N.S. 20-4) on Parrsboro Harbour as defined by N.S. fishery regulations is reasonable and just, resulting from the large volume of untreated sanitary waste discharging both directly and indirectly to Parrsboro Harbour.

2. The resident homes and summer cottages at Harrington Beach and at the river estuary contribute untreated sanitary waste to shoreline waters, and a closure as indicated (Figure A-2) is necessary as a public health protection.

3. At Five Islands the increased tourist accomodation and activity contribute to the pollution condition in the area waters. This together with land wash to streams and tributaries following rainfall events on inland farms and homes is clearly demonstrated by the bacteriological data of this report, and a closure as indicated (Figure A-3) is necessary for public health protection.

8 RECOMMENDATIONS OF THE MARITIME STANDING COMMITTEE ON SHELLFISH

The existing closure on Parrsboro Harbour is necessary and adequate and should be retained. A new closure should be implemented at Harrington Beach as shown in Figure A-2 of this report. The Sand Point area should be resampled during 1977 to determine if any closure is required.

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2. Donnelly, J.P., 1975. A Sanitary Engineering Survey Report, Five Islands, N.S.

3. Cullen, D. H., 1965. Department of National Health and Welfare Public Health Engineering Division Survey Shellfish Area N.S. 38-Advocate.

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Particular appreciation is extended to Mr. J. Machell for the reviewing of this manuscript.

APPENDIX

TABLE A-1 FECAL COLIFORM DATA, SECTOR I, PARRSBORO HARBOUR, 1976

STATION NUMBER	MPN'S PER 100 ML			MEDIAN
	JUNE 16	JUNE 19	JUNE 18	
1	240	540	>2400	540
2	540	46	>2400	540
3	240	70	>2400	240
4	<2	17	49	17
5	<2	49	32	32
6	<2	49	33	33
7	<2	4	2	2
8	<2	5	2	2
9	<2	<2	2	<2
10	<2	2	<2	<2
11	<2	<2	<2	<2
12 Existing Closure	<2	<2	<2	<2
13	<2	<2	<2	<2
14	<2	<2	<2	<2
15	<2	2	<2	<2
16	<2	<2	<2	<2
17	<2	<2	<2	<2
18	2	5	<2	2
19	<2	<2	<2	<2
20	<2	2	2	2
21	5	<2	<2	<2
22	<2	<2	<2	<2
23	<2	<2	<2	<2
24	<2	<2	<2	<2

TABLE A-2 FECAL COLIFORM DATA, SECTOR II, CLARKE HEAD, 1976

Station Number	MPN Fecal Coliform Per 100 ml								
	June 15	June 16	June 17	June 18	June 19	June 20	July 14	July 26	Median
1		350		2	<2				2
2		<2		2	2				2
3		79		2	<2				2
4		2		<2	<2				<2
5		17		<2	<2				<2
6		<2		2	<2				<2
7		2		<2	<2				<2
8		2		<2	<2				<2
9		<2		<2	<2				<2
10		13		2	<2				2
11		<2		4	<2				<2
12		2		<2	<2				<2
13		<2		2	2				2
14		<2		<2	<2				<2
15		<2		<2	<2				<2
16		<2		<2	<2				<2
17		<2		<2	<2				<2
18		2		2	<2				2
19		<2		2	<2				<2
20		<2		<2	<2				<2
21		<2		<2	<2				<2
22		<2		<2	<2				<2
23		<2		4	<2				<2
24		<2		2	<2				<2
25		5		<2	<2				<2
26		<2		<2	<2				<2
27		<2		<2	<2				<2
28		<2		<2	<2				<2
29		<2		4	<2				<2
30		<2		2	<2				<2
31		27		<2	<2				<2
32	<2		<2			<2	8	17	<2
33	2		<2			<2		8	<2
34	5		<2			2	13	17	5
35	17		<2			14		49	16
36	5		7			49	5	110	7
37	2		5			21			5
38	2		110			<2	170		56
39	2		110			<2			2
40	<2		<2			2	5	>2400	2
41	<2		2			<2	17	5	2
42	2		5			<2	5	<2	2
43	13		<2			<2	17	>2400	13
44	<2		<2			<2	13	2	<2
45	5		<2			<2		<2	<2

TABLE A-3 FECAL COLIFORM DATA, SECTOR III, FIVE ISLANDS, 1976

Station Number	MPN Fecal Coliform Per 100 ml					
	June 15	June 17	June 20	July 14	July 26	Median
1		<2		5	<2	<2
2	17	<2	<2	17	2	2
3	<2	<2	<2	10	2	<2
4	<2	2	<2	5	2	2
5	<2	<2	<2			<2
6	<2	<2	<2	14	<2	<2
7	7	<2	2	2	<2	2
8	<2	<2	2	11	2	2
9	<2	<2	<2			<2
10	<2	4	<2			<2
11	<2	<2	<2	11	2	<2
12	<2	<2	8	7	2	2
13	<2	<2	8	<2	4	<2
14	<2	2	<2	2	11	2
15	<2	<2	<2	5	<2	<2
16	<2	<2	2	<2	<2	<2
17	<2	<2	2	<2	<2	<2
18	5	<2	<2	8	<2	<2
19	<2	<2	<2	2	<2	<2
20	11	<2	<2		8	<5
21	<2	<2	4	8	2	2
22	<2	<2	2	5	<2	<2
23	<2	<2	<2	22	5	<2
24	2	<2	<2	79		<2
25	4	8	7	33		8
26		8	2	10		8
27	<2	<2	<2			<2
28		2	<2	49		2
29		5	11			8
30	<2	<2	5	10		<4
31	<2	<2	<2		8	<2
32	2	<2	<2	14	8	2
33	<2	<2	2			<2
34	<2	<2	<2	33	<2	<2
35	<2	<2	2	49		<2
36	<2	2		79	<2	<2
37	33	<2	2	33	<2	2
38	48	<2	<2	79	<2	<2
39	350	<2	<2	70	<2	<2
40	2	2	<2	130	5	2
41	<2	<2	<2	49	2	<2
42	<2	<2	<2	49		<2
43	<2	<2	7	49	<2	<2
44	2	<2	2	17		2
45	<2	<2	11	110	2	2

TABLE A-4 FECAL COLIFORM DATA STREAMS, PARRSBORO - FIVE ISLANDS, 1976

MPN'S Per 100 ml

Station Number		June 16	June 17	June 18	June 19	June 20	July 13	July 14	July 18	July 27	Median
A	Beaver Brook	350	79	79	49	33	>2400	920	350	33	79
B	Five Islands River	8	23	22	23	11	>2400	350	34	33	23
C	Shad Brook	17			17	13	>2400	240	220	8	17
D	North River	23	43	22	17	11	>2400	240	140	170	43
E	Harrington River (Beach)	500		2	<2	2	1600	220	79	10	45
F	Harrington River (Road)	2	2	8	5	8	>2400	280	170	49	8
G	Moose Creek	<2	<2	8	7	10	1600		17	8	8
H	Moose River	8	33	23	21	130	1600	540	540	5	33
I	Wasson Brook	26	49	9	26	79		350	140	11	38
J	East Parrsboro River	920	920	140	110	920	>2400	>2400	>2400	920	920
K	Swan Creek	49		23	2	11		110		7	17
L	Parrsboro Dam	5	13	11	>2400	13	>2400	>2400	>2400	33	33
M	Farrell Brook	>2400	>2400	>2400	920	920			1600	540	1600
N	Whitehall Brook	>2400	>2400	>2400	920	1600	>2400	1600	920	>2400	>2400
O	Salter Brook	4	<2	2	<2	4		79	540	350	4

TABLE A-5 TEMPERATURE AND SALINITY DATA FOR MINAS BASIN, N.S., 1976

STATION	DATE	TEMPERATURE °C	SALINITY o/oo	LOCATION
2	June 15		31.0	Five Islands
	June 20	14.5	20.2	
	July 14		31	
8	June 20	14.5	28.5	
17	June 15		31	
	June 17	13.3	25.9	
	June 20	13.8	27.3	
	July 14	16.5	27.3	
	July 26	17.0	27.7	
26	June 15		29.9	
28	June 20	14.5	27.6	
	July 14	16.5	17.7	
	July 26	19.0	27.7	
33	June 15		28.4	
34	June 17	13.3	24.6	
	June 20	14.5	27.3	
	July 14	16.5	17.7	
	July 26	18.0	27.7	
37	June 17	13.3	24.6	
	June 20	15.5	26.0	
	July 14	16.5	24.7	
44	June 15		28.5	
	June 20	16.7	14.1	
	July 14	16.5	27.6	
49	June 17	13.3	27.2	
	June 20	15.5	0.8	
	July 14	16.5	26.1	
	July 26	18	27.7	
51	June 15		29.3	
56	June 17	13.3	25.9	
	June 20	14.5	27.6	
	July 14	16.5	27.2	
57	June 15		29.3	
60	June 15		29.3	
67	June 15		26.8	
	June 17	13.3	27.2	
	June 20	14.5	28.1	
	July 14	16.5	26.8	

Cont'd

TABLE A-5 (Cont'd)

STATION	DATE	TEMPERATURE °C	SALINITY o/oo	LOCATION
9	June 16	13.3	26.7	Clark's Head
10	June 19	13.9	28.2	
14	June 19	13.6	28.1	
25	June 19	13.3	28.1	
30	June 19	13.1	29.4	
5	June 16	13.3	28.4	Parrsboro
	June 19	13.5	26.8	
18	June 16	13.3	28.0	

TABLE A-6 TIDE STAGE AND TIME OF SAMPLING, MINAS BASIN, N.S., 1976

DATE	TIME OF SAMPLING (HRS.)	TIDE	SECTOR
June 15	1500 - 1700	High Rising - High Falling	Five Islands
June 17	1630 - 1800	High Rising - High Falling	
June 20	0800 - 0945	High - Mid, Failing	
July 14	1445 - 1600	High Rising	
July 26	1445 - 1600	Mid - Low Falling	
June 16	1700 - 1900	High Falling	Clark's Head
June 18	1730 - 1815	High Rising	
June 19	0800 - 0845	High Falling	
June 16	1600 - 1700	High Rising	Parrsboro
June 18	1700 - 1730	High Rising	
June 19	0845 - 0930	High Falling	

TABLE A-7 PRECIPITATION DATA FOR THE FIVE ISLANDS AREA DURING THE STUDY PERIOD, 1976

DATE		PRECIPITATION	SAMPLING DATES
June	7		
	8		
	9		
	10		
	11		
	12		
	13		
	14		
	15	T	*
	16		*
	17	T	*
	18		
	19		*
	20	.02	*
	21	.02	
	22		
	23	.05	
	24		
	25		
	26	.65	
	27		
	28		
	29		
	30	.31	
July	1		
	2		
	3		
	4		
	5	.5	
	6		
	7		
	8	.32	
	9	.025	
	10		
	11		
	12		
	13	2.16	*
	14	.025	*

(Cont'd)

TABLE A-7 (CONT'D)

DATE	PRECIPITATION	SAMPLING DATES
July 15		*
16		
17		*
18	.54	*
19		
20		
21		
22		
23		
24	.14	
25	.41	
26		*
27		*
28	.15	
29		
30		

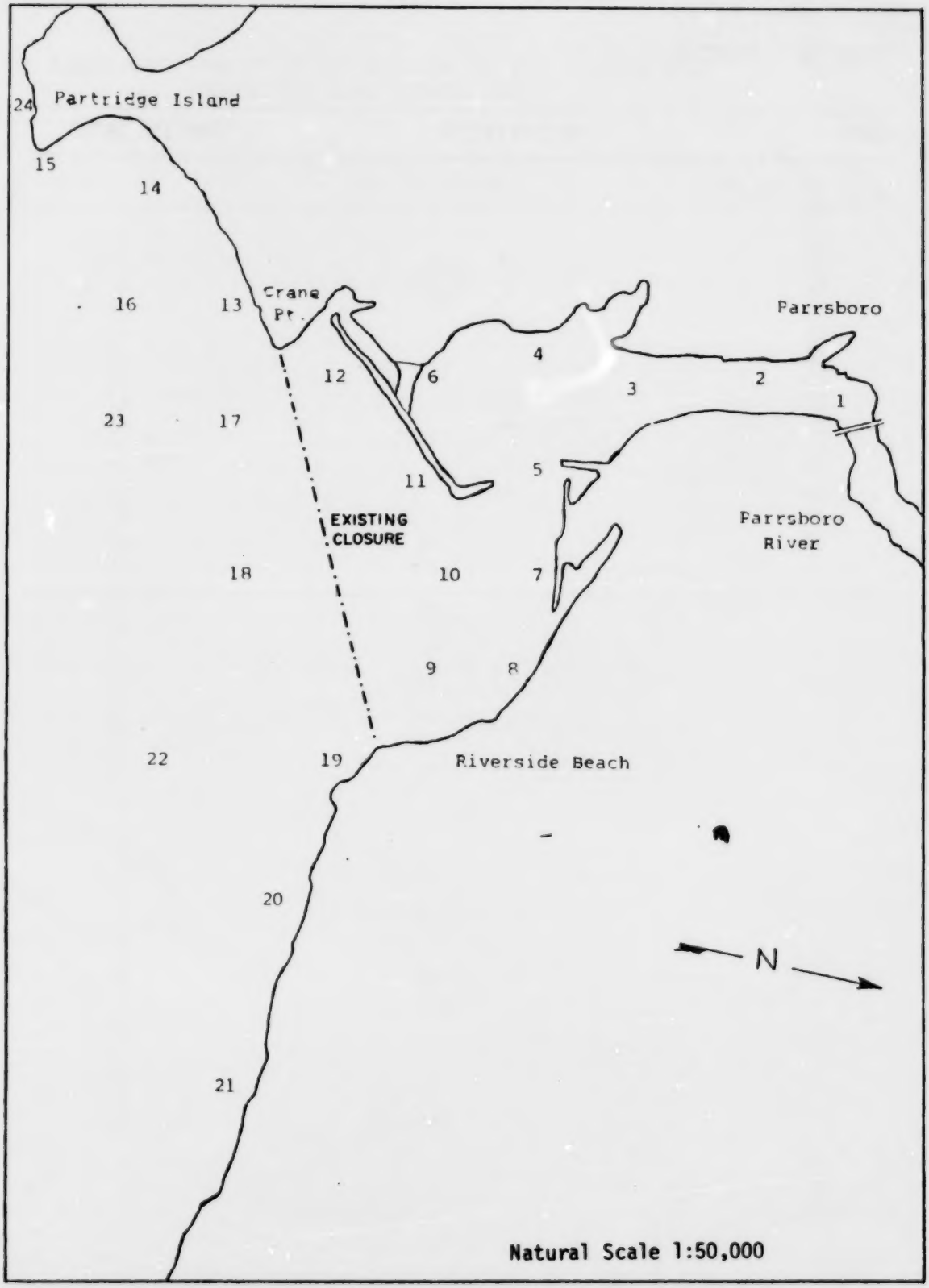

FIGURE A-1 MAP OF PARRSBORO HARBOUR (SECTOR I) SHOWING LOCATIONS OF SAMPLING STATIONS

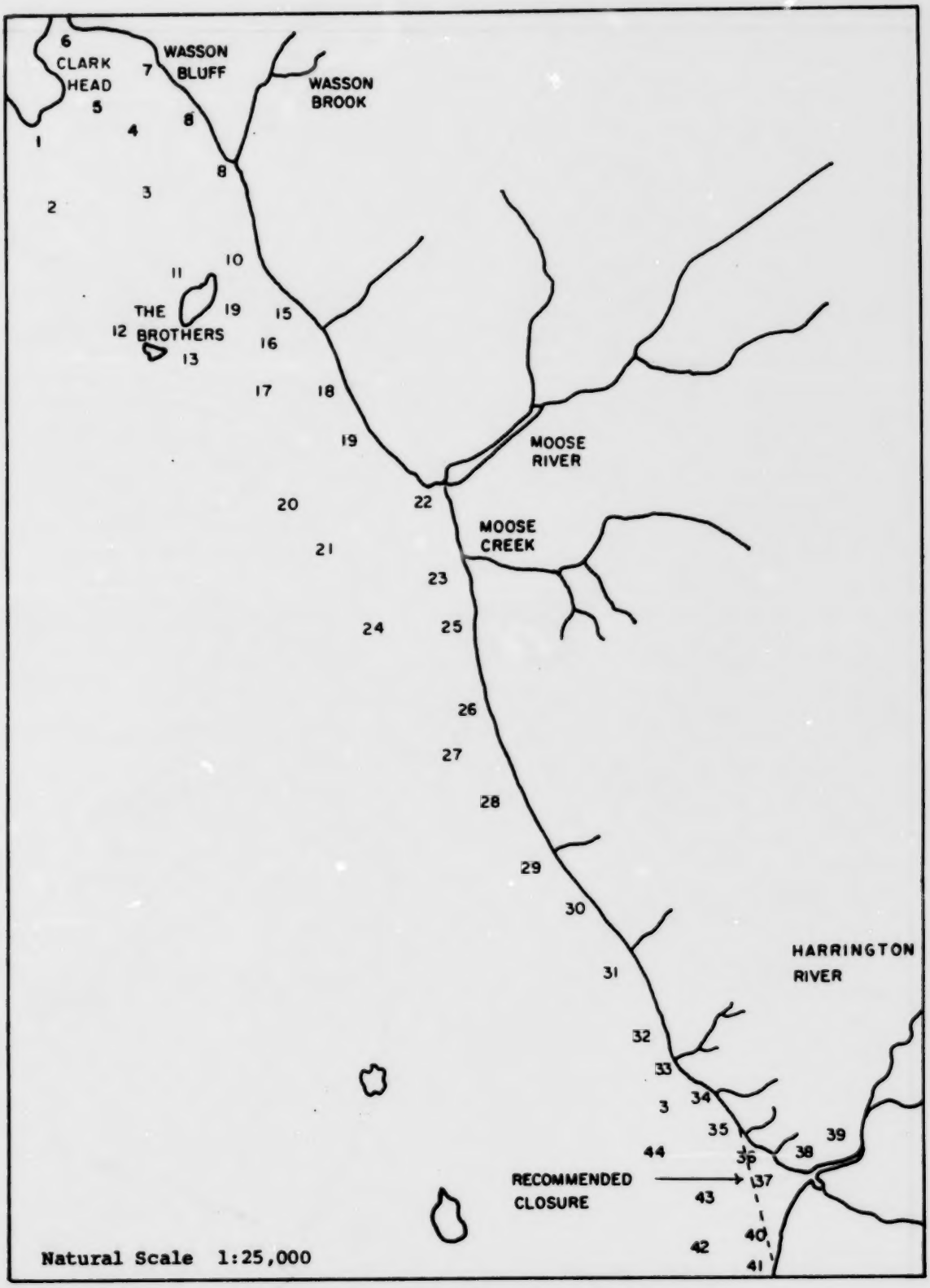

FIGURE A-2 MAP OF CLARKE HEAD (SECTOR II) SHOWING LOCATIONS OF SAMPLING STATIONS

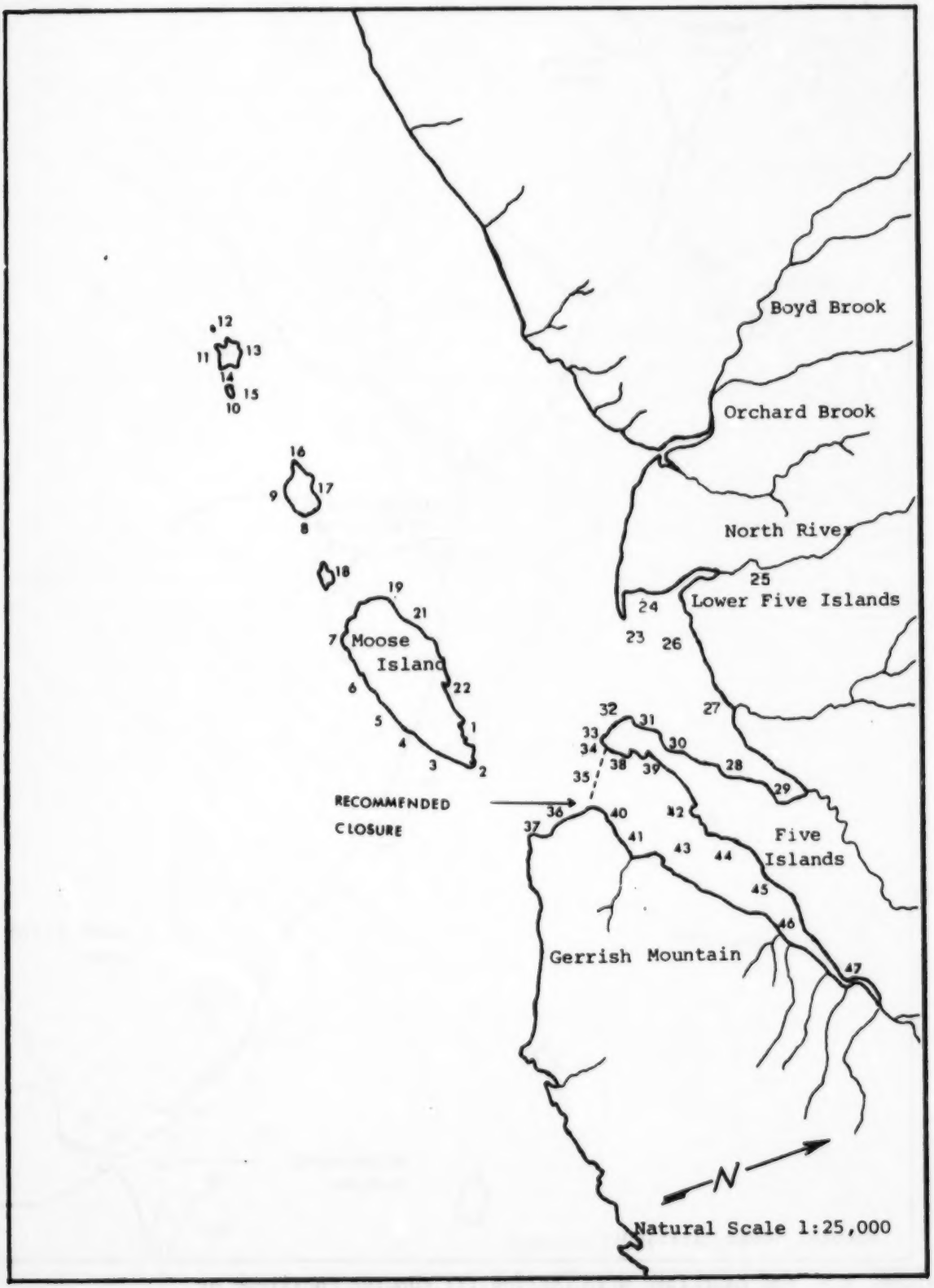

FIGURE A-3 MAP OF FIVE ISLANDS (SECTOR III) SHOWING LOCATIONS OF SAMPLING STATIONS

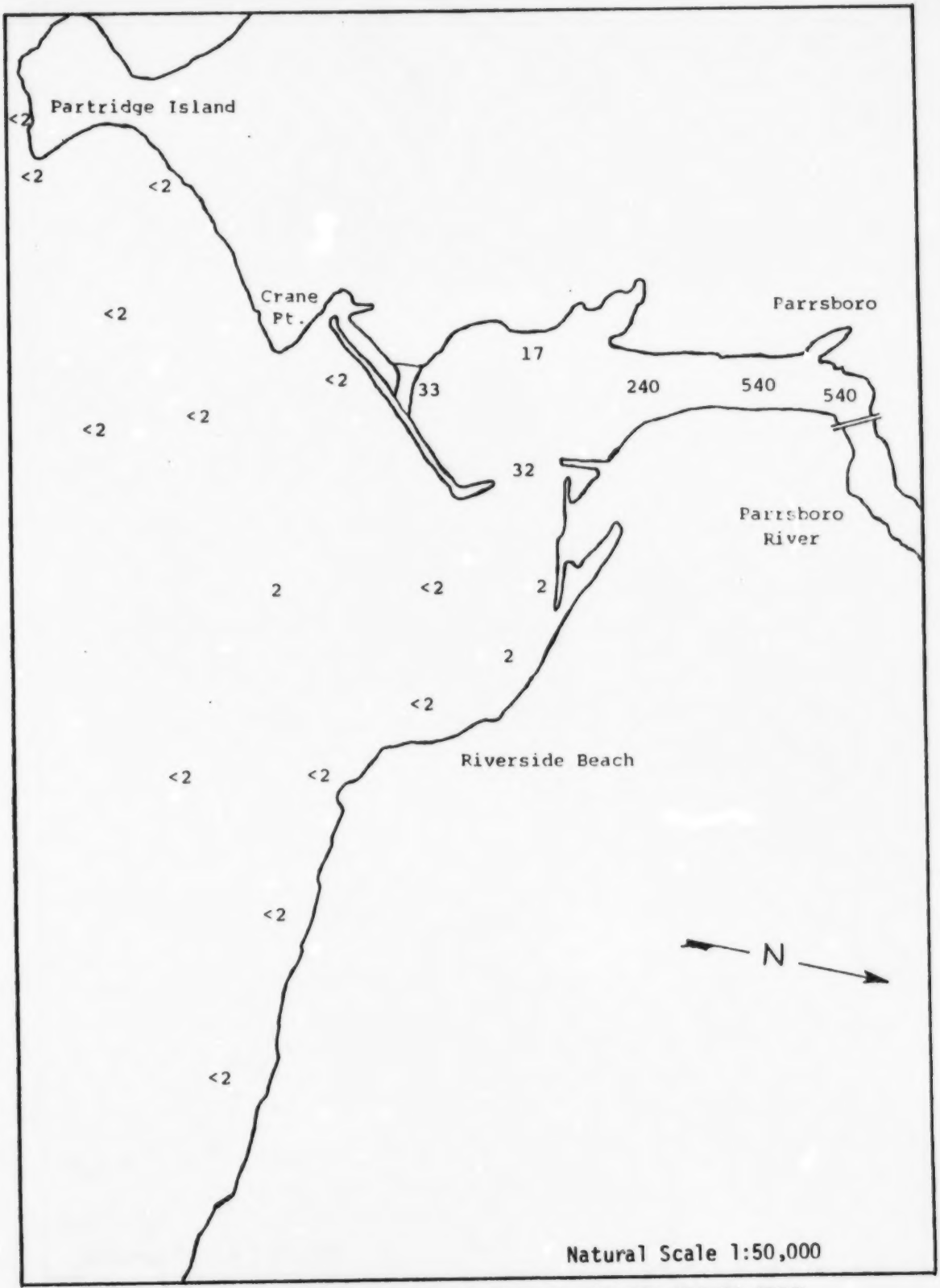

FIGURE A-4 MAP OF PARRSBORO HARBOUR (SECTOR I) SHOWING MEDIAN FECAL COLIFORM DISTRIBUTION

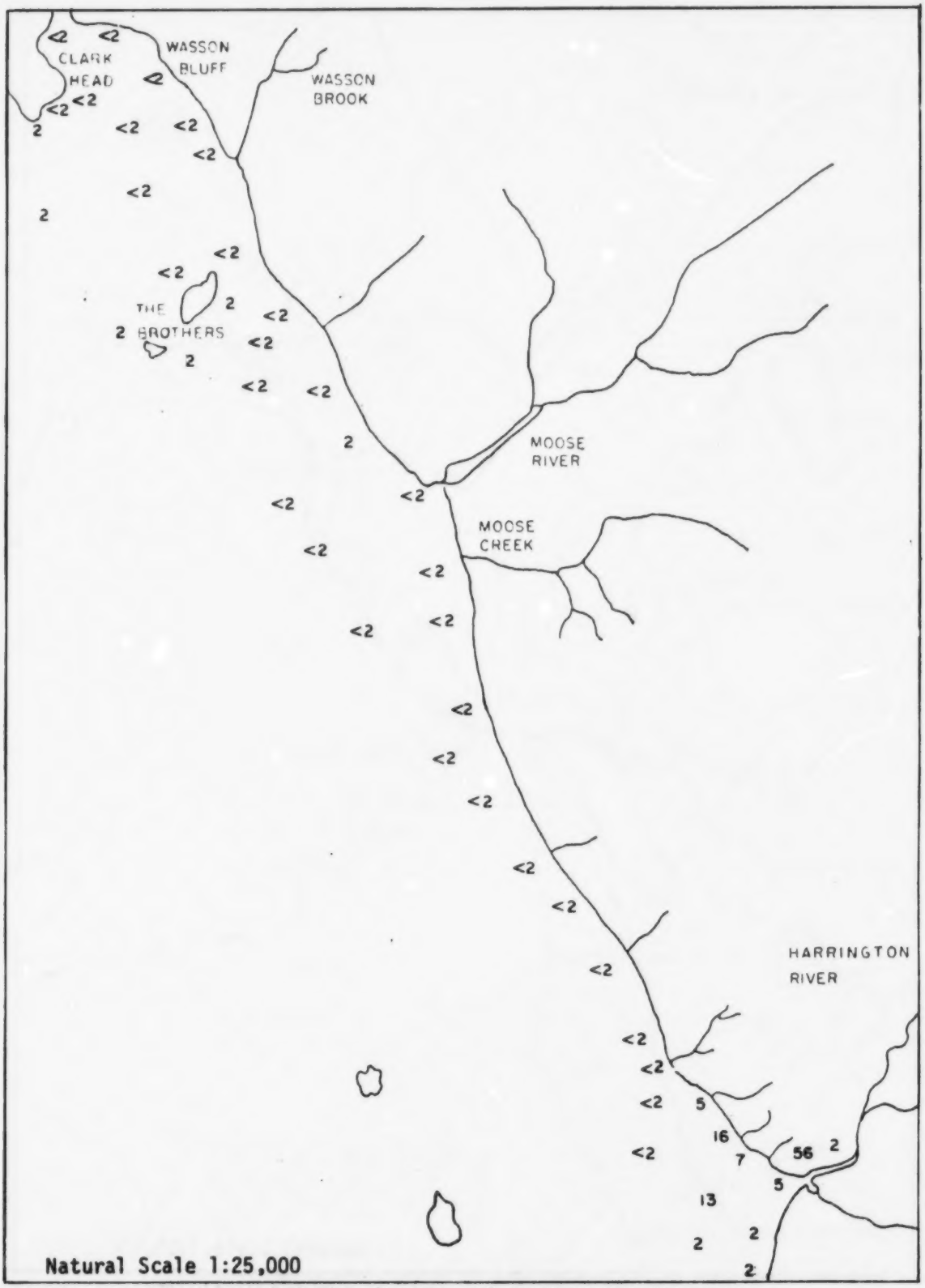

FIGURE A-5 MAP OF CLARKE HEAD (SECTOR II) SHOWING MEDIAN FECAL COLIFORM DISTRIBUTION

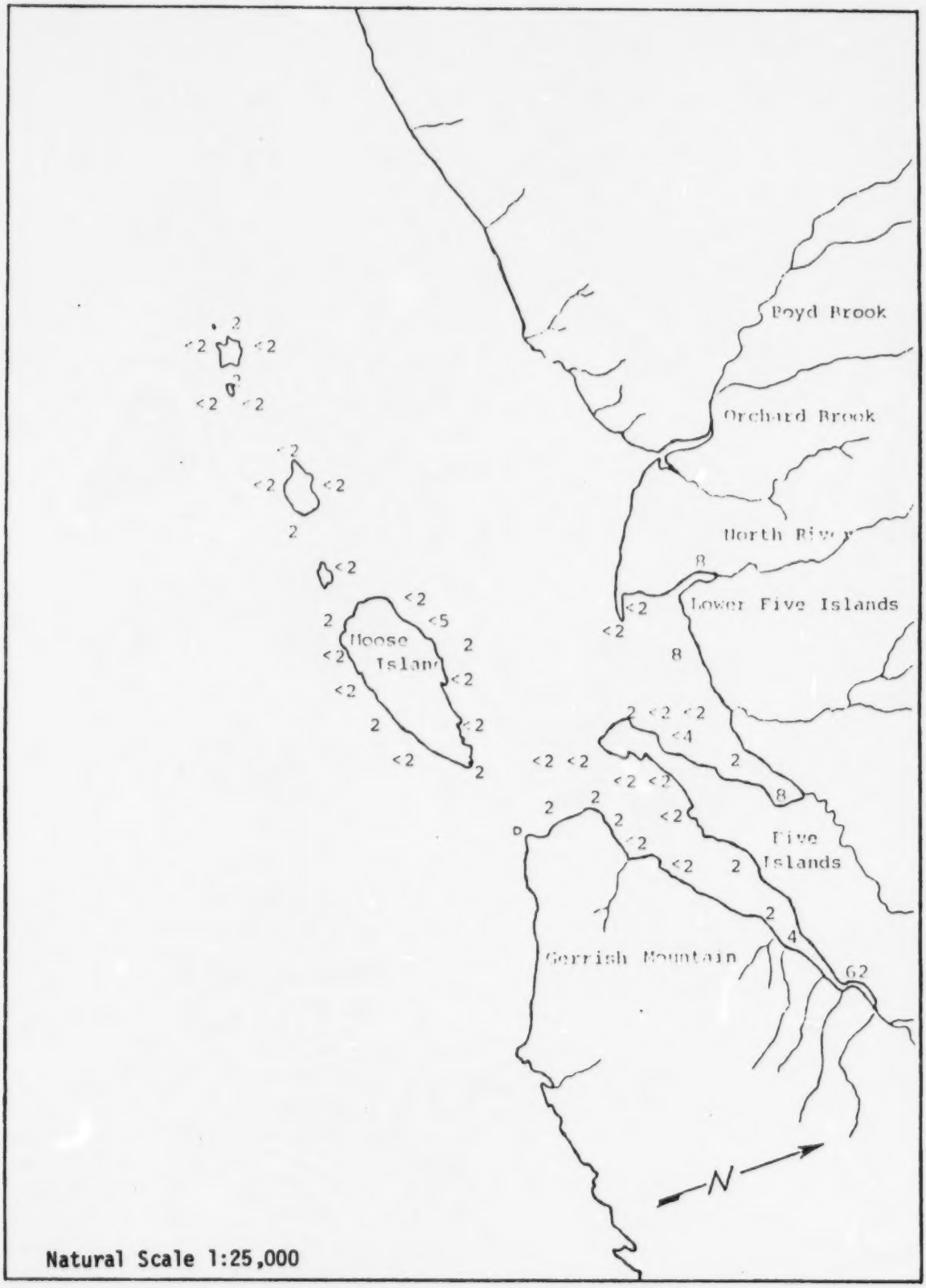

FIGURE A-6 MAP OF FIVE ISLANDS (SECTOR III) SHOWING MEDIAN FECAL COLIFORM DISTRIBUTION